2025 ENVIRONMENTAL INFORMATION SERVICES WORKING GROUP REPORT TO THE UNITED STATES CONGRESS

BY THE ENVIRONMENTAL INFORMATION SERVICES WORKING GROUP (EISWG)
APPROVED BY THE NOAA SCIENCE ADVISORY BOARD

APRIL 29, 2025

Eighth Annual Report to the United States Congress

by the NOAA Science Advisory Board's (SAB)
Environmental Information Services Working Group (EISWG)[1]

29 April 2025

Executive Summary

The Weather and Water Enterprise (WWE) is essential to the safety, economic prosperity, and national security of the United States. Anchored by NOAA, the WWE brings together government, industry, and research institutions in a proven partnership that drives American innovation and competitiveness. This enterprise must be protected.

NOAA's weather portfolio provides a critical foundation that underpins the WWE. The WWE is built on sustained NOAA investments in research, observations, forecasts, severe weather warnings and impacts-based decision support services. These investments ensure that individuals, businesses, and communities have access to the life-saving information they depend on every day.

The value and return on investment of NOAA are exceptional. The $1.3 billion annual investment in NOAA's National Weather Service supports a WWE network of business, academic, and research entities valued at over $15 billion[2] annually—yielding more than $100 billion[3,4] annually in national economic benefits. As the Reinsurance Association of America recently stated, "Perhaps no other federal entity facilitates greater economic and commercial activity than NOAA."

Consequences to the WWE and America of a weakened NOAA are broad and severe. Americans face year-round threats from hurricanes, tornadoes, floods, droughts, wildfires, and extreme heat and cold. In this context, a "fail fast and learn" approach is simply unacceptable. Innovation must be pursued through thoughtful risk management that safeguards lives, sustains services, strengthens national resilience and promotes prosperity.

Recent decisions have put vital services—and the American people and businesses that rely on them—at risk. A clear, coordinated strategy is urgently needed to modernize NOAA without compromising core capabilities. Mandates that

reduce NOAA's workforce, close facilities, eliminate programs or transfer responsibilities, must fully account for their immediate and long-term impact on services and national safety.

NOAA can and should be more agile in adopting innovative technologies. These emerging technologies can improve all services, including weather research, observations, coupled forecast models, and communications, while enhancing agility, accuracy, and efficiency. The path forward must avoid unacceptable risk and balance innovation with reliability and public trust.

EISWG urges the following actions:

- **Congress** should reauthorize the Weather Research and Forecasting Innovation Act of 2017 (H.R. 6093) to uphold the National Weather Service's mission to "provide weather, water and climate data, forecasts, warnings, and impact-based decision support services for the protection of life and property and enhancement of the national economy."

- **Congress and NOAA** should continue leveraging the Science Advisory Board (SAB) and its working groups, including EISWG, to provide external independent advice on strategies to strengthen NOAA science and services.

- **NOAA** should engage other external organizations, such as the National Academies, to help clarify public-private roles in the WWE and to enable innovative contracting for public private partnerships to spur advances, reduce risks, and improve NOAA's overall effectiveness and efficiencies.

Footnotes & References:

[1]SAB and EISWG members are drawn from the private sector, universities, and stakeholder communities, all from outside NOAA. The Weather Research and Forecasting Innovation Act of 2017 (Public Law No.: 1150-25, Sec. 401) directs EISWG to report annually to Congress on research and innovations to improve weather forecasting.

[2]https://www.archivemarketresearch.com/reports/weather-solutions-55062

[3]https://www.weather.gov/media/about/Final_NWS%20Enterprise%20Analysis%20Report_June%202017.pdf

[4] Lazo, J. 2024: Communicating Forecast Uncertainty (CoFU) 2: Replication and Extension of a Survey of the U.S. Public's Sources, Perceptions, Uses, and Values for Weather Information. An AMS Policy Program Study. The American Meteorological Society, Washington, D.C. https://doi.org/10.1175/cofu2-2024

[5]Reinsurance Agency of America letter to The Honorable Howard Lutnick, Secretary, U.S. Department of Commerce, February 27, 2025.

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An Urgent Call to Action

The Weather & Water Enterprise (WWE)—comprising businesses, universities, NOAA, and other partners—plays a critical role in supporting public safety, economic productivity, and national security. As weather and water-related challenges grow in frequency and impact, continued innovation and coordination are essential.

NOAA's weather portfolio provides the foundation upon which the WWE depends. Although NOAA represents a small portion of the overall enterprise, it enables a much larger system—approximately ten times its size—that collectively generates over $100 billion in economic value each year.

Recent Federal actions are having adverse effects on NOAA, and thus the WWE, reducing their effectiveness, increasing risk to lives and property, and constraining economic growth.

A strong WWE depends on a strong NOAA, and both require sustained executive and legislative support. EISWG, along with other external advisory bodies, are prepared to provide independent, objective input to strengthen the enterprise's efficiency, effectiveness, and capacity for innovation.

The time to act is now.

Section 1: Introduction

The Weather Research and Forecasting Innovation Act of 2017 (Public Law No.: 1150-25, Sec. 401) states “the NOAA Science Advisory Board (SAB) shall continue to maintain a standing working group named the Environmental Information Services Working Group (EISWG).” In the same act, the EISWG is charged by Congress to provide advice to NOAA and its line offices (including the National Weather Service - NWS) on innovative technologies and strategies, and to report back to Congress annually. EISWG members are drawn from the private sector, universities, stakeholder community, and others, all from outside NOAA. EISWG assembles findings and makes recommendations that are focused on, but not limited to, the use of new research, technology and innovations to improve the value of weather and water services to the Nation.

Today’s Concerns:

a) Recent Federal actions with regard to NOAA are undermining the effectiveness and future of the U.S. Weather and Water Enterprise (WWE). This enterprise benefits from a balance between private industry, universities and the public sector providing great value and safety to the U.S. The public sector (including NOAA, USGS, USACE, etc.) is a critical foundation for the enterprise. However, NOAA’s ability to provide the multitude of weather and water observations, forecasts and warnings, impact-based decision support, and the research and development that underpins the weather and water information enterprise, is at risk. The recent Federal actions threaten current weather information accuracy, its availability, and NOAA’s ability to implement future improvements. This risks American public safety, harms our private sector, and threatens our economy - all of which weakens our nation.

b) A “fail fast and learn” approach is not acceptable for the WWE where the risks of even short-term failure are simply too great. (It can be effective in testing and development, such as in testbeds, where rapid feedback can alter directions with minimal risk.) Weather and water information underpin critical real-time decisions across numerous sectors, from safeguarding lives to securing economic assets. A single misstep in WWE systems can lead to devastating consequences — widespread damage, loss of life, and cascading disruptions to national infrastructure and security. That said, the WWE must innovate. As society grows more vulnerable to weather and water extremes, and as technology rapidly advances, the need to modernize becomes urgent. Enhancing effectiveness and efficiency across systems is essential. But innovation within the WWE must be pursued thoughtfully—driven by rigor, not haste—ensuring that progress never comes at the expense of public safety, national security, or economic stability.

Section 2: Report Outline

The rapidly growing concerns around a number of recent Federal actions that directly impact NOAA, the WWE, and the American public and businesses, have led the EISWG to focus its Eighth Annual Report to Congress on the resulting impacts of these actions. It begins by highlighting the uncertain future of the WWE and the potential impacts resulting from these actions. It then describes the value of the WWE to the Nation and the critical role that NOAA plays within it. It closes by outlining a set of shared goals, recommendations to leadership, and a vision for how EISWG can continue to contribute going forward.

Section 3: An Uncertain Future for NOAA

Americans receive great value for their investments in NOAA. The National Weather Service (NWS), for an entire year, costs each person less than a single cup of coffee. Forecasts are generated through an interconnected information value chain involving the collection of Earth system observations (atmosphere, ocean, land and ice) from a multitude of sources, data assimilation, numerical modeling, statistical postprocessing, forecaster insights and decision support. Reducing support of these critical foundational capabilities weakens the links in the information value chain and increases the risks of failures on critical weather days. Eroding NOAA investments further in this area without allowance for innovation and efficiency casts an uncertain future.

The Government Performance and Results (GPRA) Act of 1993 (P.L. 103-62) and the GPRA Modernization Act of 2010 (P.L. 111-352) require government agencies to develop strategic plans, set measurable goals and report progress to improve effectiveness, efficiency and public accountability. Decades of monitoring of these long-term performance statistics has contributed to impactful improvements in forecast quality and skill across multiple mission service areas by guiding priorities and identifying gaps. Actions taken without consideration of these metrics risk slowing or reversing the past positive trends in improvement.

Furthermore, if actions are taken to cut NOAA programs and decommission key NOAA facilities without an evaluation of timing or impacts, there could be severe interruption of the current operational system with elevated uncertainty and added risk to a well-established weather information pipeline. Facilities potentially targeted for closure include national nerve centers for research, modeling, forecasting, weather radar, and satellite operations, among others, all vital to the information value chain that supports the safety and prosperity of American people and businesses nationwide.

The risks are compounded by external uncertainties, including:

- Replacement models: How fast could others, including private industry, step in to seamlessly maintain the information value chain systems and fulfill NOAA's broad range of Congressionally mandated responsibilities?
- Service Areas: Will all communities, both large and small, across all of America, be served by non-public entities and approaches, and what business model can support this critical service?
- Impacts-Based Decision Support Services (IDSS): A top priority of NWS forecasters at each Weather Forecast Office (WFO) is to support local stakeholders during severe weather, even to the extent of embedding in Emergency Operations Centers. How will this critical forecast interpretation be provided in the face of shrinking staff?
- Operational systems: How can a shift toward privatization be hardened against service outages, which could be severely disruptive, even putting American lives at risk, while creating a major drag on the economy and damaging national security?
- Interruption in data services: What entity will ensure/replace/protect NOAA's high value role in the collection and processing of real-time and long-term observations that contribute to the prediction of wildfire, extreme weather, ocean health, and transportation, as well as the training of artificial intelligence (AI) systems?

Section 4: Capabilities at Risk Across the Nation

Also at risk is the WWE private sector, annually a $15B dollar industry, which substantially depends upon NOAA information to add value and innovation. The American Economy runs not only on innovation and hard work, but also on environmental information including recent and upcoming weather and water conditions, both benign and hazardous. This information flows continually into innumerable systems that make the public safer, protect our infrastructure, and thus make the businesses that depend on them (e.g., aviation, shipping, agriculture, tourism, etc.) (e.g., aviation, shipping, agriculture, tourism, etc.) more resilient to severe weather and water events and their impacts.

As such, actions that weaken NOAA in turn weaken the broad WWE.

Examples of at-risk capabilities include:

- Support to emergency managers in Florida who use NWS hurricane wind and storm surge forecasts, and Impacts-Based Decision Support Services from forecasters, to decide on evacuations
- Warnings for the family in rural Arkansas to decide when to go to a community shelter in advance of tornadoes

- Predictions of extreme rain and river flow in the west, and the atmospheric rivers that produce them, to help reservoir managers balance water scarcity with flood control for communities, farmers and firefighters
- Forecasts for road icing conditions for a trucker planning a route to safely deliver food
- Support for forest-fire emergency response at the Boise National Interagency Coordination Center and at active fire incident command centers
- Wind forecasts for the farmer in Kansas applying pesticides efficiently and safely
- Three-month seasonal outlooks for farmers to select appropriate crops that are vital for national food production
- Guidance to help NASA and the private sector safely launch their satellites and maintain them through solar storms
- And many more examples.

Section 5: The Value of the Weather and Water Enterprise and the Foundational Role of NOAA

NOAA, including the NWS, is an integrated system of people, applications of R&D, observing and high performance computing infrastructure, client and partner relationships - domestic and international - all of which contribute to its value and impact. Additionally, the NWS works synergistically with the research and private sectors. There is an enterprise-wide consensus about the respective roles and responsibilities of the government, research, and private sectors in the WWE that has matured and flourished over the past two decades. Quoting the Priorities for Weather Research (PWR) Report[1] (2021, p. 11), "*NOAA, and the NWS, as the provider of most weather observations and forecasts, and as the only federal agency charged to provide weather warnings, are core to these greater enterprise activities, and vital to their success.*"

Improving Public Safety: Severe weather of all types, from minor impacts to major disasters, are disruptive threats to safety and prosperity across the U.S., with more frequent, more damaging, and more deadly severe weather events impacting every state (NOAA NCEI database[2]). Major severe weather events include hurricanes and tornadoes, winter storms and freezes, floods and droughts, extreme heat waves and wildfires. Tracked since 1980, these major, $1B-and-greater-loss events (including 27 in 2024), have caused over $2.9 trillion in damage (CPI adjusted) and have resulted in nearly 17,000 deaths[2]. Countering the growing weather threat, NOAA weather information flows from observations to computer models to the delivery and interpretation of severe weather forecasts and warnings. This information, in combination with complementary key roles of the private sector and research centers, provides emergency managers with trusted impact-based decision support, saving

American lives and preventing billions of dollars in damage every year. The International Association of Emergency Managers (IAEM) recently wrote: “The NWS is the backbone of weather preparedness efforts in the United States. Its dedicated professionals provide life-saving forecasts, warnings, and advisories that enable emergency managers to make informed decisions, activate emergency response plans, and issue public alerts and warnings.” (Letter to the SAB. Dated 17 December 2024 and included as appendix III.)

Ensuring Economic Vitality: The U.S. WWE is a globally unique, highly integrated, collaborative system of federal, state, and local agencies, private industry, and research institutions. Collectively, the WWE produces weather and climate information valued at over $100 billion annually—vastly exceeding the Federal investment that enables it. NOAA’s observations, models, and forecasts serve as the foundation of this Enterprise, supporting an open-access system that fuels a $15 billion-per-year private sector portion of the Enterprise. The Weather and Water Enterprise of 2025 that is at risk consists of a highly integrated, mutually dependent, and synergistic community of people and organizations. Degradation of these inputs constrains economic growth.

Section 6: Necessary Priorities

The Nation continues to suffer major human and economic losses from weather and water extremes, and these losses have been increasing year-over-year for decades. They are driving communities to the edge of long-term viability, particularly when the insurance industry cannot handle coverages for the massive events that are increasingly experienced. These changes threaten the ability of many Americans to pursue their lives and livelihoods in the areas they consider home. Research to improve forecasts is vital to mitigating these increasing problems.

Section 7: Strategic Vision for a Productive WWE

To ensure U.S. public safety, economic strength, and national security, the EISWG supports the following vision:

- **A healthy WWE that leverages NOAA-funded contracts and grants to support innovation from universities and private industry.** Federal investments in weather and water research are critical to advancing Earth system observations, science and forecasts, and are designed to help NOAA improve its provision of data and forecasts for direct public benefit, and for use by the broader WWE, which, when combined, support the Nation. These grants are largely consistent with the weather research priorities set forth in the NOAA Science Advisory Board’s Priorities for Weather Research Report (2021; Summary Table in Appendix II).

- **A NOAA that is empowered with the staff and resources necessary to meet its current and growing demands.** A clear and overarching strategy that improves the effectiveness without damaging vital services of the WWE backbone is needed for achieving greater efficiencies. Terminating NOAA staff positions, closing facilities, and cutting programs must only be done with detailed consideration of their impacts on the many NOAA outputs that underpin the WWE and together support the economy, public safety and national security. Early career employees, as being some of the "probationary" status workers, have been disproportionately affected. Early-career scientists are among the agency's most dynamic and least expensive - and they are also the future of NOAA. In addition, experienced senior level staff taking unplanned early retirement offers, without well-managed succession planning, adds risk and unnecessary interruptions. A number of excellent scientists, with specialized skill sets are already unavailable to return. This brain drain will have lasting negative impacts on NOAA's ability to support the much larger WWE.

- **A National Weather Service that supports a Weather Ready Nation and delivers reliable and accurate forecasts in the interest of public service.** Decades of public investment have resulted in a NWS that provides local decision support to stakeholders and decision makers where and when it is needed. In the face of growing weather hazards, this support not only needs to be secured but it also needs investments for ongoing improvements. Once again, this role underpins the entire WWE.

Section 8: Recommendations to Leadership

- NOAA and Congress are encouraged to use the NOAA Science Advisory Board (a Federal Advisory Committee) and all of its Working Groups, including the EISWG, to solicit external advice to identify and refine strategies to address opportunities and challenges across NOAA. For example, in response to a 2020 Congressional mandate, the SAB and EISWG organized over 150 subject matter experts from across the Enterprise to generate the Priorities for Weather Research (PWR) Report in 2021. This decadal-scale report continues to provide important guidance to the Congress, NOAA, and the general weather information community and could be revisited as it approaches its five-year midpoint.

- Congress is encouraged to continue the reauthorization process for The Weather Research and Forecasting Innovation Act of 2017 (see H.R. 6093). It is important that the reauthorization emphasizes that NOAA retain its statutory role to "provide weather, water and climate data, forecasts, warnings, and impact-based

decision support services for the protection of life and property and enhancement of the national economy." It could further highlight the priority needs of continued investment in observational and computing infrastructures, artificial intelligence, and workforce readiness, to sustain and improve forecasts and warnings, in support of the entire Enterprise. The PWR Report provides details.

- At a later time, Congress is encouraged to use subject-matter experts, and a transparent process, to strategically explore future NOAA areas of innovation and pathways toward improved efficiency. Examples include: high performance, parallel processing and cloud computing; artificial intelligence and deep learning; open science frameworks for collaborative development; and transformational observing technologies such as cubesats, radars, uncrewed observing systems, data assimilation, etc. Careful consideration should be given to where and how public and private roles can be optimized, including more innovative contracting mechanisms. In addition to the SAB, its Working Groups and EISWG, Congress can also consider services such as those provided by the National Academies of Sciences Engineering and Medicine's (NASEM) Board on Atmospheric Sciences and Climate [BASC; the same entity that led the Fair Weather Report (2003)], the NASEM Ocean Studies Board (OSB) to emphasize Earth system approaches, and the National Academy of Public Administration to address organizational challenges.

Section 9: The EISWG's Role and Future Engagement

The EISWG, formalized by Congress in the 2017 Weather Act, advises both NOAA and policymakers by leveraging real-world experience (businesses, science programs, forecast users, etc.). It values a strong federal backbone that fosters private-sector growth. EISWG's recommendations specifically consider strategies that balance evolving internal NOAA capacities with empowering private sector and research entities to address gaps and pursue opportunities together for improved services to the Nation. This strategy is consistent with the recommendations of the Priorities for Weather Research Report (2001), including the specific recommendation on integration with the Enterprise (PWR recommendation FE-10 in Appendix II).

Furthermore, EISWG's recommendations help safeguard against degradation of essential data and promote innovation to enhance services that safeguard public safety, national security, and the prosperity of Nation.

- Two recent EISWG reports (one each on radar and the use of proprietary data)[3,4] included guidance to foster growth and opportunity in the private sector, informed

by research advances, while also maintaining a strong federal "backbone" capability to ensure vital information is available to all Americans, not just those who can afford their own. These recommendations addressed new satellite and radar technologies, and serve as a model for others. In each case NOAA has adopted core elements of these recommendations, as have the private and research sectors.

- Multiple EISWG reports have focused on the positive impacts of innovation and broad engagement across the WWE. EISWG has recommended prioritizing: (1) more robust data distribution to the WWE that includes the use of the commercial cloud[5]; (2) surface and space-based observations supporting space weather forecasts[6]; (3) improving coupled atmosphere-ocean models and uncrewed systems observations supporting more accurate hurricane forecasts with longer lead times[7];(4) IDSS and warn-on-forecast approaches to increasing the lead time and effectiveness of tornado and other warnings[8]; (5) model sensitivity studies to optimize the design and impact of future observing networks[9]; and (6) advances in the Unified Forecast System (UFS)[10] and Artificial Intelligence (AI)[11] that could improve short-term forecasts and enable subseasonal to seasonal scale weather outlooks[12].

Future EISWG Engagement: EISWG has worked successfully with the SAB, and with other SAB Working Groups, to develop findings and recommendations for NOAA and for major reports required by Congress (e.g., PWR), all with an eye toward supporting the WWE's combined ability to inform decisions locally, regionally and nationally. EISWG will continue to engage the SAB, its WGs, and the Enterprise as subject matter experts in these and other areas.

We further propose for discussion the following possible EISWG-specific activities. In executing these, a "whole-enterprise" approach would be used that factors in how foundational capabilities in NOAA support the entire WWE and its broad range of roles in public safety, economic vitality and national security.

- The EISWG, SAB, and NOAA leadership explore creating a rapid-response process that could be used to objectively and independently assess and provide rapid feedback on the impacts of major actions already taken, or being considered in the future, that can crosscut the entire WWE.

- The EISWG continues to identify and report on what is required to ensure America has the best forecasts, related weather and water data, and decision support tools to both support our nation and compete internationally, including in economic and national security spheres.

- The EISWG further considers what international data sharing relations are needed to develop more accurate forecasts with longer lead times to support safety and prosperity at home and abroad.

EISWG stands ready to provide experienced, grounded and independent advice to continue supporting innovation in the Weather and Water Enterprise, including NOAA's enabling of it, and the benefits they produce in combination.

Section 10: Closing Remarks

The ability for NOAA to provide U.S. citizens and businesses free, accurate, 24 x 7 x 365 weather and water observations, model data, forecasts, and decision support has already been compromised by recent federal actions. Service failures are increasingly likely: radar outages; supercomputer breakdowns; and missed observations, forecasts and warnings. Some activities critical to accurate model forecasts have been affected (e.g., the number of weather balloon launches cut back due to staff cutbacks and budget). These adverse impacts are multiplied by the fact that these NOAA data and services underpin the entire WWE and all the decisions informed by those outputs.

Everyone can become more efficient and effective in their working processes; recent federal actions are predicated on this principle. However, for NOAA to pursue efficiencies while maintaining service quality takes time for forethought and preparation. This is crucial given NOAA's mission-critical services to the American people. Rapidly introduced reductions can destabilize the important life saving functions, but with time and innovation, efficiencies and improved performance outcomes can be achieved while avoiding service failures and not undermining the values that accrue from the WWE at large.

To regain the level of confidence, trust and service that the American public and businesses require to remain safe and prosperous, we reiterate that:

- NOAA is central to and serves as an essential foundation of the WWE
- The WWE, including especially NOAA, needs executive and legislative support in this key moment
- The WWE can effectively and efficiently support public safety, a vibrant economy and national security.

It is critical to act quickly. Degraded systems, lost scientific staff, closed facilities and cancelled programs are difficult to restore. Meanwhile, the ever present threat of severe weather will be compounded by the coming hurricane season, tornado season, wildfire season, and deadly floods, droughts and heat waves.

References

[1]NOAA Science Advisory Board, 2021: A Report on Priorities for Weather Research (PWR). NOAA Science Advisory Board Report, 119 pp. https://doi.org/10.25923/w9fg-g569 https://sab.noaa.gov/wp-content/uploads/2021/12/PWR-Report_Final_12-9-21.pdf
[2]https://www.ncei.noaa.gov/access/billions/
[3]EISWG, 2023a: Final report on a NESDIS Observing System Backbone Framework.
[4]EISWG, 2023b: Final report on Radar Gaps.
[5]EISWG, 2021: Statement Concerning the Ongoing NWS Data Dissemination Challenges.
[6]EISWG, 2023c: Statement on Global Oscillation Network Group (GONG) and its Successor Data Source for Space Weather Operations.
[7]EISWG, 2020: Report and Recommendations to the NOAA SAB concerning the Hurricane Forecast Improvement Program.
[8]EISWG, 2019a: Final Report Review and Recommendations to NOAA of the "Report to Congress – Tornado Warning Improvement and Extension Program Plan (TWIEP)".
[9]EISWG, 2019b: Final Report on Use of Observing System Simulation Experiments (OSSEs) at NOAA.
[10]EISWG, 2019c: Final Report and Recommendations to the NOAA SAB concerning the Earth Prediction Innovation Center.
[11]EISWG, 2024: Report on NOAA Investment in Deep Learning Numerical Weather Prediction.
[12]EISWG, 2022: Report Concerning the NOAA Report to Congress: Subseasonal and Seasonal (S2S) Forecasting Innovation: Plans for the Twenty-First Century.

Appendices

I. EISWG Terms of Reference
II. PWR Report Summary Recommendation Table
III. Letters from the Enterprise

Appendix I. EISWG Terms of Reference

NOAA Science Advisory Board
Environmental Information Services Working Group (EISWG)
TERMS OF REFERENCE
Revised February 2018

Background:

In 2012, the NOAA Science Advisory Board (SAB) confirmed the Environmental Information Services Working Group (EISWG) as a standing working group of the SAB. SAB charged EISWG to work closely with all five NOAA Line Offices (National Marine Fisheries Service – NMFS, National Ocean Service – NOS, Oceanic and Atmospheric Research – OAR, National Environmental Satellite, Data, and Information Service – NESDIS, and National Weather Service - NWS), in order to: 1) provide advice on improving communication among the sectors, 2) provide advice on incorporating scientific and technical capabilities to enhance NOAA products and services, 3) provide a sounding board regarding implementation of NOAA's Policy on Partnerships in the Provision of Environmental Information, and 4) evaluate NOAA effectiveness in responding to advice received from the EISWG, and the environmental information enterprise as a whole. The EISWG also leverages the knowledge and expertise of the other SAB working groups as necessary.

In 2017 the President signed PL 115-25 into law. *The Weather Research and Forecasting Innovation Act of 2017* affirmed and authorized the EISWG as a standing working group of the SAB and assigned additional, specific charges to the working group.

Charge:

(1) to provide advice for prioritizing weather research initiatives at the National Oceanic and Atmospheric Administration to produce real improvement in weather forecasting;

(2) to provide advice on existing or emerging technologies or techniques that can be found in private industry or the research community that could be incorporated into forecasting at the National Weather Service to improve forecasting skill;

(3) to identify opportunities to improve communications (A) between weather forecasters, Federal, State, local, tribal, and other emergency management personnel, and the public; and (B) communications and partnerships among the National Oceanic and Atmospheric Administration and the private and academic sectors; and

(4) To address such other matters as the Science Advisory Board requests of the Working Group membership.

In general, the Working Group shall be composed of leading experts and innovators from all relevant fields of science and engineering including atmospheric chemistry, atmospheric physics, remote sensing, meteorology, hydrology, social and behavioral sciences (including risk communication), electrical engineering, and computer sciences.

In carrying out its charge, the Working Group may organize into subpanels.

The Working Group shall be composed of no fewer than 15 members. Nominees for the Working Group may be forwarded by the Working Group for approval by the Science Advisory Board. Members of the Working Group may choose a chair (or co-chairs) from among their number with approval by the Science Advisory Board. EISWG members will be appointed for one three-year term renewable for one additional three-year term.

Reporting:

Not less frequently than once each year, the Working Group shall transmit to the Science Advisory Board, for submission to the Under Secretary, a report on progress made by National Oceanic and Atmospheric Administration in adopting the Working Group's recommendations. The Science Advisory Board shall transmit this report to the Under Secretary. Within 30 days of receipt of such report, the Under Secretary shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives a copy of such report.

Appendix II: Priorities for Weather Research (PWR) Report

The NOAA Science Advisory Board (SAB) Priorities for Weather Research (PWR) Report (2021) Recommendation Summary Table listing 33 major recommendations and outcomes.

TABLE 1: PRIORITIES FOR WEATHER RESEARCH - RECOMMENDATION SUMMARY TABLE	
OBSERVATIONS AND DATA ASSIMILATION (OD)	
Priority Area 1	**Use and Assimilation of Existing Observations**
OD-1	Maximize the use and assimilation of underutilized ground based, airborne and marine observations - *to ensure maximum value is derived from the full suite of observations in the Earth system model*
OD-2	Maximize the use and assimilation of underutilized satellite observations - *to ensure maximum value is derived from the full satellite constellation in support of an Earth system model approach*
Priority Area 2	**Advanced Data Assimilation Methods, Capabilities and Workforce**
OD-3	Establish new support of novel methodology research and workforce development for data assimilation - *to advance weather prediction and develop the future workforce*
OD-4	Advance coupled Earth system data assimilation for weather, water and sub-seasonal to seasonal forecasting - *to enable observations in one Earth system component to influence corrections in multiple components*
OD-5	Advance the production of regional and global reanalyses - *to improve detection of extreme events, forecast performance evaluation, improve use of observations*

Priority Area 3	**Observation Gaps and Use and Assimilation of New Observations**
OD-6	Develop and deploy a national boundary layer, soil moisture and aerosol observing system - *to improve research and prediction at the interfaces with other Earth system model components*
OD-7	Observe the ocean, its surface boundary layer, and ocean-atmosphere feedbacks - *to fully utilize knowledge of the ocean as a source of predictability in an Earth system model*
OD-8	Implement a multi-phase program to improve the forecasting of atmospheric rivers - *to better anticipate and mitigate water cycle extremes and their cascading impacts*
OD-9	Fill radar gaps using diverse weather radars and data assimilation - *to better detect significant precipitation and severe weather over a greater area and more equitably across the population*
OD-10	Prioritize smallsat/cubesat observation and data assimilation trade studies and demonstrations - *to define the role of smallsat/cubesat technologies for complementing large satellite systems*
FORECASTING (FO)	
Priority Area 1	**Foundational Earth System Modeling**
FO-1	Accelerate Earth system model development and seamless prediction - *to improve forecasts of all components of the Earth system - atmosphere, oceans, cryosphere, land - on all time and space scales*
FO-2	Achieve the best possible operational numerical weather prediction system - *to provide more accurate weather information to the American public, thus decreasing our vulnerability to weather extremes*
FO-3	Establish a regular, sustained Earth system reforecasting activity - *to enable a more effective cadence and accelerated process for operational model improvements*

Priority Area 2	**Advancing Critical Forecasting Applications**
FO-4	Enhance prediction of Earth's water cycle extremes - *to improve forecasting of floods, droughts and hydrologic processes*
FO-5	Increase efforts to advance predictive capabilities for fire weather and air quality - *to better inform the public during wildfire events and hazardous air pollution episodes*
FO-6	Improve forecasts of high-impact weather through multisector partnerships - *to provide more accurate and timely watches and warnings for extreme weather events*
FO-7	Advance research on coastal processes in Earth system models for comprehensive coastal analyses - *to improve coastal forecasts of waves, currents, storm surges, total water levels and water quality*
INFORMATION DELIVERY (ID)	
Priority Area 1	**Highly Reliable, High-resolution Weather Information Dissemination**
ID-1	Embrace open science - *to provide uniform access to all communities, support a geographically distributed, diverse workforce, broaden access to talent, and increase agility and innovation*
ID-2	Complete the existing plan to address National Weather Service operational data dissemination challenges - *to solve critical data access and visualization software issues facing weather forecasters*
ID-3	Develop NOAA-wide strategic and operational support for Weather Enterprise data integration and dissemination - *to ensure effective NOAA data sharing and use across all sectors and hazards*

Priority Area 2	**Virtuous Cycle of Collecting and Analyzing Social, Behavioral and Interdisciplinary Observations**
ID-4	Prioritize research on equitable and effective use of hazardous weather information - *to better understand and inform diverse hazard and risk assessment needs, protective decisions and action*
ID--5	Develop and evaluate probabilistic and deterministic hazard information delivery capabilities for diverse end-users - *for rapid dissemination of useful products and to strengthen decision support*
ID-6	Build capacity to collect and analyze baseline and event-specific social and behavioral data - *to learn what weather information is needed when, by whom, and how it can and will be used*
FOUNDATIONAL ELEMENTS (FE)	
Priority Area	**Science**
FE-1	Develop a weather-knowledge ecosystem - *to create, educate, apply and advance weather information synthesis, modeling, automated/human forecasting, communication & decision support*
FE-2	Continue to invest in understanding the basic physics and chemistry of the Earth system - *to ensure that all important processes that affect weather are accurately included in the forecast models*
FE-3	Accelerate the NOAA Artificial Intelligence (AI) Strategy and expand artificial intelligence research - *to provide higher quality and more timely products and services for societal benefits*
FE-4	Greatly increase university involvement in NOAA research - *to gain their assistance in advancing the NOAA mission and in training the next generation of NOAA scientists*
FE-5	Create multi-university research consortia - *to address critical research issues for NOAA*
Priority Area	**Computing**
FE-6	Immediately invest and develop plans for substantially more computing resources - *in order to achieve the goals recommended in this report that are vital to enhance the U.S. Weather Enterprise*
FE-7	Convert, prepare for, and leverage emerging high performance computing architectures - *to keep pace with technological advances and develop the software tools and IT workforce for the future*
Priority Area	**Workforce Development**
FE-8	Develop a pipeline of diverse talent from K-12 students to lifelong learning - *to train and keep current generations of researchers and practitioners in weather science and technologies*
FE-9	Develop an enterprise vision for workforce education and training - *to accommodate different line office needs and leverage existing resources available to the broader community*
Priority Area	**Weather Enterprise Integration**

FE-10	Support a Weather Enterprise data integration and dissemination strategy and sustained operational oversight - *to improve weather data, modeling, computing, forecasting, and decision support*

Appendix III

December 17, 2024

To: NOAA Science Advisory Board
From: International Association of Emergency Managers
Re: Statement of Support for National Weather Service

The International Association of Emergency Managers (IAEM) strongly supports maintaining the National Weather Service's (NWS) critical role as an emergency manager's trusted source for weather predictions and forecasts. IAEM represents emergency managers nationwide who rely on the NWS daily. As a critical partner, the NWS plays a vital role in safeguarding our communities from the impactful threats posed by severe weather.

Emergency managers plan and prepare for extreme weather events and are increasingly confronted with more frequent and intense extreme weather, such as floods, tornadoes, and wildfires. Accurate and timely weather forecasts are more essential than ever to lessen the public's risk of adverse weather conditions that may threaten the lives, families, and communities we serve.

The NWS is the backbone of weather preparedness efforts in the United States. Its dedicated professionals provide life-saving forecasts, warnings, and advisories that enable emergency managers to make informed decisions, activate emergency response plans, and issue public alerts and warnings. They do it 24 hours a day, often while deployed alongside emergency managers under austere and, at times, hazardous conditions on the frontlines of an incident where their insights are needed the most to protect lives and property. Altering the NWS' service delivery model, requiring local jurisdictions to have greater reliance on private-sector weather forecasts—potentially at a significant cost—would jeopardize the safety of residents and visitors alike. Additionally, for resource-constrained jurisdictions, privatizing weather forecasting could make it impossible to access the timely information needed, increasing risks to life and property, especially in rural and under-resourced areas.

While private-sector weather companies play a valuable role in the broader weather enterprise, the NWS must remain empowered to provide public forecasts and warnings. More specifically, IAEM urges Congress to reject proposals that strip the NWS of its forecasting authority.